

Planetary Optical and Infrared Imaging

Jet Propulsion Laboratory
California Institute of Technology
Pasadena, CA 91109

Richard J. Terrile

Strategy

The purpose of this investigation is to obtain and analyze high spatial resolution CCD coronagraphic images of extra-solar planetary material and solar system objects. These data will provide information on the distribution of planetary and proto-planetary material around nearby stars leading to a better understanding of the origin and evolution of the solar system. Tests of high efficiency coronagraph designs on ground-based telescopes will support the Astrometric Imaging Telescope (AIT). Observations using a membrane mirror will test imaging improvements possible by adaptively compensating for atmospheric seeing. Imaging within our solar system will provide information on the current cloud configurations on the outer planets, search for new objects around the outer planets, and provide direct support for Voyager, Galileo, and CRAF by imaging material around asteroids.

Progress and Accomplishments

Over the last year an analysis of multispectral and polarization images of the disk of material around the nearby star Beta Pictoris suggests that the material is very low albedo and similar to dark outer solar system carbon rich material. This material is believed to be associated with the formation of planets and provides a first look at a planetary system much younger than our own. A coronagraphic search for other systems has already examined over 120 nearby stars and an image processing data system has been set up to evaluate these data and to establish limits for circumstellar material. Initial coronagraphic observations were taken with a tilt-tip adaptive optics system as a precursor to a membrane mirror.

Projected Accomplishments

A survey of the nearby stars will be completed and data will be examined more deeply to provide limits on the probability of circumstellar material around stars and to understand the morphology of young planetary systems. Observations made by combining a coronagraph with a membrane mirror adaptive optics system will allow more sensitive searches and provide test data for more advanced applications of seeing compensation. Tests will be made of components of a higher efficiency coronagraph on ground-based telescopes using graded occulting masks. Further analysis of the Beta Pictoris polarization data as a function of color will be used to model the particle size distribution of dust in the disk. Coronagraphic

imaging of the outer planets, asteroids and star forming regions will continue to provide support for ongoing missions such as Voyager, Galileo, CRAF, Cassini and AIT.

Publications

1 paper and 6 abstracts published.

Richard J. Terrile:

Hansen, C. J., McEwen, A., Ingersoll, A. P. and Terrile, R. J. (1990) "Surface and Airborne Evidence for Plumes and Winds on Triton." *Science*, **250**, 421.